

ORDINANCE NO. 186

AN ORDINANCE REQUIRING DEVELOPER-USERS AND SINGLE-USERS OF WATER AND SEWER WITHIN THE CITY OF WILLOW PARK, TEXAS, OR ITS EXTRATERRITORIAL JURISDICTION TO CONSTRUCT TO THE SPECIFICATIONS OF THE CITY OF WILLOW PARK ALL NECESSARY LINES AND APPURTENANCES THERETO THAT THE CITY OF WILLOW PARK MAY REQUIRE TO SERVICE THE AREA OF INTENDED USE; REQUIRING THAT IN SUCH INSTANCE, A DEVELOPER'S CONTRACT BE ENTERED INTO BETWEEN THE APPLICANT AND THE CITY; SETTING FORTH THE ENGINEERING CRITERIA AND STANDARDS RELATED THERETO; REQUIRING APPROPRIATE PERFORMANCE BONDS, SURETY BONDS, MAINTENANCE BONDS, AND PUBLIC LIABILITY INSURANCE DURING THE PERIOD OF CONSTRUCTION; REQUIRING THE PAYMENT OF AN INSPECTION AND ENGINEERING FEE AT TIME OF EXECUTION OF THE DEVELOPER CONTRACT; CONTAINING AN EXEMPTION CLAUSE AS TO SINGLE-FAMILY USE OF A PRIVATE WATER WELL OR SEPTIC TANK IN OPERATION AS OF THE DATE OF PASSAGE OF THIS ORDINANCE; REQUIRING A DEDICATION OF ALL SUCH WATER AND SEWER FACILITIES PLACED WITHIN PUBLIC RIGHTS-OF-WAY OR PUBLIC EASEMENTS TO THE CITY OF WILLOW PARK; CONTAINING A SEVERABILITY CLAUSE, A PENALTY CLAUSE, AND PROVIDING FOR PUBLICATION AND AN EFFECTIVE DATE.

BE IT ORDAINED BY THE BOARD OF ALDERMEN FOR THE CITY OF WILLOW PARK, TEXAS:

I.

A "Developer-User" as that term is used herein is any person firm, or corporation intending or desiring to provide water and/or sewer services to other than one family for that one family's use.

A "Single-User" as that term is used herein is a user intending or desiring to have water and/or sewer services provided to one family for that single one family's use.

II.

A Developer-User shall, and is hereby required, prior to the initiation of any work incident thereto to enter into a developer's contract with the City of Willow Park on such form as the City may require and in such covenant contract and agree as follows:

1. To comply with all of the regulations, specifications and requirements

with respect to the installation of water lines and appurtenances thereto as outlined and contained in Exhibit "A" attached hereto and incorporated by reference as fully as though copied verbatim herein.

2. To comply with all of the regulations, specifications and requirements with respect to the installation of sewer lines and appurtenances thereto as outlined and contained in Exhibit "B" attached hereto and incorporated by reference as fully as though copied verbatim herein.
3. To submit to the City of Willow Park and have approved by it all of the plans incident to the installation, placement, configuration, design, and elevation of any and all water and/or sewer lines to be placed within any public right-of-way or utility easement.
4. To provide appropriate surety bonds, performance bonds, and maintenance bonds in favor of the City of Willow Park in amounts as may be required by the City's Engineer commensurate with the nature and scope of the intended improvement.
5. To provide a policy of public liability insurance naming the City Of Willow Park as a named insured during the period of construction and installation of all such improvements.
6. To pay an engineering and inspection fee to the City of Willow Park, Texas, in an amount no less than 5% of the total cost of the improvements to be installed with such payment being due at and on the date of the entry and execution of the developer contract.
7. To erect at the City Council's direction appropriate barricades and safeguards to best insure the safety of motorist and others utilizing publicways, thoroughfares, and easements during any such period of installation and construction.
8. To restore to the same or better condition after installation and construction of such improvements the surface of all easements, rights-of-way, or roadways to the end that after construction such surface shall be in the same or better condition as was the case prior to the initiation of construction.
9. After acceptance of all such improvements by the City of Willow Park, to then dedicate all such improvements to the City of Willow Park.

III.

It shall be unlawful for a Developer-User to sell, convey by gift, or lease developed real property within the development to be served without first having

complied with the requirements of this ordinance.

IV.

The Developer-User shall be required to extend water mains throughout the intended development area and from its boundaries as well to the nearest water source available from the City and to pay all of the installation and construction costs related thereto as well as such other costs as hereinabove are set forth.

V.

The Single-User shall likewise be required to extend a water main from the Single-User's property line to any existing City owned water main located no further than 200' from the property line of the Single-Family User and to likewise comply with all other requirements set forth herein as are herein required of a Developer-User. The Single-User shall not be required to construct and install a water main from the property line of his or her property a distance greater than 200' in order to connect to present City owned water main facilities.

VI.

In those instances where a Developer-User desires to supply sewer services to an area to be developed, and no City owned sewer mains exist within a distance of one-half (1/2) mile from the property line of the area to be developed and existing City sewerage facilities, then all solid and liquid waste disposal emanating from the area to be developed shall be accomplished, handled and thereafter maintained in accordance with the procedures as set forth in Exhibit "B" attached hereto governing waste disposal.

VII.

The City through this ordinance establishes a cost reimbursement policy inuring to the benefit of either category of user who, in compliance with this ordinance, has extended either water or sewer lines from the nearest source available by the City to the property line of the property or area to be serviced shall be entitled to a cost reimbursement of such lines when the same extends past separately owned property located between point of origin at existing City mains and the property line of the intended user's area. Prior to the issuance of a building permit to any owner of property within the perimeters of the area last described, i.e., source or origin and the original developer user, the intervening property owner shall be required to tie on to each such facility and to reimburse to the original extender of either or both such lines his or her pro-rata cost of such original extension predicated on the percentage of number of feet from point of original origin to the intervening property owner's tie-on or tap. In computing such distance, the center of the front property line of the intervening user's property shall be the determining point.

VIII.

Single-Users having in operation a water well serving the single-family lot only and/or a septic tank serving such single-family lot only being used and operated for such single-family only as of the date of the passage of this ordinance shall be exempted from the application of this ordinance provided that such use is not discontinued for a period of sixty (60) continuous days. If, in fact, such existing usage is discontinued for a period of sixty (60) continuous days, then, this ordinance shall apply and be enforceable as to such single user. When such use has been discontinued for sixty continuous days, the single user shall thereafter have from that date forward sixty (60) days in which to initiate construction of the appropriate tie-on or extension to tie-on as are hereinabove required: and thereafter, an additional sixty (60) days in which to complete the same.

IX.

Any user tying on to either water and/or sewer lines shall pay an initial tap fee as shall be set by the Board of Alderman from time to time in amounts sufficient to defray the cost to the City of obtaining and installing appropriate meters and inspection fees and no tie-on shall be permitted or authorized unless and except upon application to the City and the payment of such fees as may, at that time, be required by the Board of Aldermen.

X.

All previous ordinances in conflict herewith are repealed to the extent of the conflict

XI.

Any person, firm or corporation that violates, disobeys, neglects or refuses to comply with, or that resists the enforcement of, any of the provisions of this ordinance shall be fined not less than TEN DOLLARS (\$10.00) nor more than TWO HUNDRED DOLLARS (\$200.00) for each offense. Each day that a Violation is permitted to exist shall constitute a separate offense and shall be punishable as such.

The City may also bring suit for injunction against any person, firm or corporation that shall violate or threaten to violate any of the provisions of this ordinance, in order to prevent a continued violation of such threatened violation.

XII.

This ordinance shall be in full force and effect from and after the date of its publication as required by law.

PASSED AND ADOPTED, this 23 day of FEB, 1984

APPROVED:

By: Leslie A. Cooley
Mayor

ATTEST:

By: Lee Ann Nave
City Secretary

EXHIBIT A
DESIGN CRITERIA FOR WATER PROJECTS

GENERAL

The following is approved as the usual Standard Design Criteria for all improvements for the Willow Park Water System or privately operated water systems in the City of Willow Park and its E.T.J. Privately operated water systems shall comply with the Rules and Regulations for Public Water Systems as published by the Texas Department of Health.

1. AVERAGE DAY WATER USE: 215 GPCD
2. MAXIMUM DAY:
For "Maximum Day" unrestricted, multiply the annual average day by 2.25.
3. MAXIMUM HOUR:
For "Maximum hour" unrestricted use, multiply the maximum day by 2.00.
4. PERSONS PER RESIDENTIAL CONNECTIONS: 3.5
5. Maximum rate of loss due to friction in a transmission main should not exceed 5-7 feet/thousand feet.
6. Water mains should be sized to meet Max. Hr. or (Max. Day + Fire Flow)
7. Fire flow should be rated at 500 GPM residential areas.
8. COMPUTATIONS

$$\text{Max. Day/connection} = \frac{(2.25)(215)(3.5)}{1,000,000} = 0.00169 \text{ MGD}$$

$$\text{Max. Hr./connection} = (2.00)(0.00169) = 0.00338 \text{ MGD}$$

TABLE I
 TABULATION OF MAIN SIZE REQUIREMENTS-FOR RESIDENTIAL
 DEVELOPMENTS OF VARYING SIZES

Number Residences	Number People	Max. Hr. MGD	Max. Day & F.F. (MGD)	Pipe Size & Loss Per 100'
100	350	0.34	1.61	10" @ 12.2'
300	1050	1.01	1.98	12" @ 7.6'
500	1750	1.69	2.29	16" @ 1.7'
700	2450	2.37	2.62	16" @ 2.2'
1000	3500	3.38	3.13	16" @ 3.6'
1500	5250	5.07	3.97	16" @ 7.6'
2000	7000	6.76	4.82	24" @ 1.8'
3000	10,500	10.14	6.51	24" @ 3.6'
4000	14,000	13.52	8.20	24" @ 6.4'

9. SUPPLY STORAGE VS. PUMPING:

The maximum hour demand should be supplied with not less than 60% from pumping capacity and not more than 40% from available elevated or pressurized ground storage.

10. ELEVATED STORAGE DEPLETION:

Elevated storage should be maintained not less than 33% full maximum hour demand period.

11. PIPE CLASS

Either C900 Poly Vinyl Chloride (PVC) which will withstand a minimum pressure of 150 psi or Ductile Steel Pipe meeting similar criteria.

12. QUICK CLOSING VALVES:

Quick closing valves will not be permitted in any water facility connected to the City of Willow Park and its E.T.J. or private systems operating within the city.

MINIMUM WORKING PRESSURE:

In residential areas, the working pressure in mains shall not be less than 40 p.s.i., except in isolated high areas where the pressure shall not be less than 30 p.s.i.

LOOPING MAINS

All feeder mains shall be looped and all laterals in excess of 1000' in length shall be looped. Not less than 6" mains shall be used for looping purposes, except that 4' mains may be used to loop dead ends to provide circulation. Dead end mains shall be avoided if at all possible.

Each water main shall be valved in such a manner as to enable initial sterilization and testing after construction and to enable repairs to pipe with a minimum interruption to customer service.

MINIMUM SIZE WATER LINES

1. DESIGN CRITERIA: The following design criteria shall be considered to be a minimum basis for sizing water lines in various locations within the City of Willow Park, and its Extra-Territorial Jurisdiction (ETJ).
 - a. The minimum residential water service line shall be 3/4". The normal location of water service lines shall be in the parkway in front of the property and 5' east or north of the center of the property frontage.
 - b. The normal 'Location of water mains shall be in the north or east one-quarter of the street, as appropriate.
 - c. Four inch (4") mains may be installed in cul-de-sac, to serve not more than six (6) residential customers, provided that no fire hydrants are required in the cul-de-sac.
 - d. If a fire hydrant is required in the cul-de-sac, the minimum line size shall be six inches (6"). Streets longer than 350 feet which end in cul-de-sacs must have a fire hydrant in the cul-de-sac. Cul-de-sacs 300 feet or less from the center of the connecting street must be served by a fire hydrant located at the connecting street intersection.
 - e. If a water main extends for an unsupported length of 1,000 feet, the minimum size shall be eight inches (8"), except where street layout is composed of essentially parallel streets consistently longer than 1,000 feet between looping connections, but not more than 1,500 feet between such connections. In these parallel street systems, lines six inches (6") in nominal diameter may be alternated with eight inch (8") lines to provide an alternating pattern of 6"-8"-6"-8", etc.
 - f. For Water mains less than 1,000 feet long between looping connections six inch (6") pipe may be used, except in cases when fire coverage requires installation of more than one fire hydrant between looping connections.
 - g. Provisions shall be provided for flushing dead end mains, such as through a fire hydrant placed near the terminal end of the line.
 - h. If two fire hydrants are required between looping connections, the minimum main size shall be eight inch (8").

- i. The minimum size main in commercial or industrial developments shall be eight inches (8").
2. DOUBLE MAINS: To prevent cutting of pavement, a system of double mains may be used, but the carrying capacity of the two mains shall not be less than the carrying capacity of a single main designed to serve the area. In areas where development requires service connection to mains in major thoroughfares, double mains shall be used, with one behind either outside curb.

3. SIZING WATER SYSTEMS:

- a) For large industrial sites or areas, water mains will be sized to meet projected demand for both industrial requirements and fire coverage.
- b) Peak demand for apartments shall be determined on the basis of not less than that required under the following formula published in the June, 1967, AWWA Journal.

$$Q = U + 15 \sqrt{U}$$

Where: U set equal to the number of family units, results in Q equal to gallons per minute (GPM).

- c) For large residential and commercial developments, the water main design shall be based on the total ultimate development as projected from the proposed development platting and/or street layout. Further, for large residential areas, the normal water service maximum hour demand to be used for feeder main design shall be considered to be not less than 2.0 GPM per lot.
 - d) For smaller such areas, the normal water service maximum hour demand will be greater, so that in the sizing of individual service mains, the demand shall be taken as not less than 5.0 GPM per service.
 - e) In addition to normal maximum hour water service requirements, full consideration shall be given to fire flow requirements as superimposed on maximum day demand conditions, elevation, and the type of development proposed, in arriving at the final water main capacity design demands to be used in pipe sizing.
1. FIRE HYDRANTS: Fire hydrants shall be spaced so that every insurable risk shall be not more than 500 feet air-line distance from the fire hydrant, and not more than 800 feet hose-line route distance from a fire hydrant. Hose-line route shall be considered as following public streets and/or dedicated fire

lanes.

- a) Fire hydrants located along major thoroughfares or streets subject to high traffic density shall incorporate a gate valve in the lead, even though the attaching lateral main may be less than twelve (12") in diameter.
 - b) Locations for fire hydrants shall be selected where possible to provide the shortest possible lead under street pavement.
 - c) Under specific conditions where fire hydrant placement requires the hydrant be set further into a parkway than standard dimensional requirements, such distance shall not exceed nine feet (9') perpendicular distance from adjacent hard surface, to allow for Fire Department pumper hose attachment.
 - d) All fire provisions must be approved by Willow Park Fire Department.
 - e) The ground line on fire hydrants in a standard installation shall be set even with the elevation of the top of adjacent existing or proposed curb (elevation specified). When parkways are to be developed with a rolling or irregular slope, the ground line index on the fire hydrant shall be set to the proposed ground elevation (specified) at the point of installation.
5. PRESSURE REGULATORS: In low areas where pressures may exceed 100 p.s.i., builders and plumbers should be advised that in such locations, pressure reducing devices should be installed as part of the plumbing.
 6. AIR AND VACUUM RELIEF: Air and vacuum relief valves shall be installed in high points along feeder mains, transmission mains or major mains to exhaust trapped air or relieve vacuum from the system.
 7. BLOW OFFS: In low points along transmission mains, blow off vaults may be required in the system to drain the mains.
 8. CLEAN OUT WYES: In strategic locations along lateral lines, feeder mains, transmission mains, etc., cleaning wyes shall be provided for passing "Polly Bags" through to sweep trash and debris from the pipe. These shall be supplemented with chlorination and sampling points, as required for the proper sterilization of the main. Locations for these wyes will be determined through conference with the City Engineer.

EXHIBIT B
DESIGN CRITERIA FOR SEWER PROJECTS

GENERAL

The following are minimum Standard Design Criteria that must be met for all sanitary improvements in the City of Willow Park and in its E,T.J.

PRIVATE SEWAGE FACILITIES

Septic Tank Systems are to be designed in accordance with the "Construction Standards for Private Sewage Facilities" as published by the "Texas Department of Health. The minimum lot size shall be 40,000 square feet.

Treatment Plant Systems shall be designed in accordance with the "Design Criteria for Sewerage Systems" as published by the Texas Department of Health.

SANITARY SEWER MAINS AND/OR SUB-MAINS

1. BASIC PRELIMINARY INFORMATION

- a. Determine the area within the natural drainage limits to be served by the proposed mains from information assembled from:
 - (1) Contour maps,
 - (2) Field surveys,
 - (3) Highway drainage information,
 - (4) or Other suitable sources.

- b. Estimate the population load to be served by the main. In no case shall this be considered to be less than the population obtained by multiplying the gross area in areas obtained under 1 above, by 3.0 houses per acre times 3.5 people per house. However, this minimum computation shall not be employed in the face of sound information relating to the particular area in question indicating a higher population than the minimum.

- c. Prepare a preliminary map .of the area to be served by the main, both present and future, on which shall be shown:
 - (1) Limits of the drainage area concerned,
 - (2) All recorded subdivisions,
 - (3) All known proposed subdivisions,
 - (4) Location of all water courses,

- (5) Tentative location of proposed main, showing probable point of connection to existing sanitary sewer. (A check should be made at this time to establish whether or not "per connection charges" are applicable for connection to the existing sanitary sewer),
- (6) All state, county and city roads and streets dedicated for public use, and
- (7) Property lines of all tracts in vicinity of main location with present owners shown.

2. PRELIMINARY DESIGN PROSEDURE

- a. Make a preliminary survey of the tentative main location, along with such alternate locations as this field survey might indicate as desirable, this survey to include:
 - (1) Plan survey showing relation between property corners and proposed sewer main center line; this information to be in sufficient detail to properly locate the proposed main on the preliminary map and determine the number of properties involved for securing the necessary right-of-way.
 - (2) Profile survey showing:
 - (a) Field-determined elevation of any existing manhole invert, stub or sewer main to which the proposed sewer line is to connect.
 - (b) Elevation of ground at center line of proposed main at each station, half station and/or ground break.
 - (c) Elevation of ground 100 feet left and right of center line at each station.
 - (d) Elevation of any draw, creek, depression, pond, lake or water course within 300 feet of any portion of the center line at intervals not to exceed 100 feet, with proper reference made as to location with respect to center line.
 - (e) Elevation of stub out of each existing house or building to be served directly by the main if available. In case stub is not available, ground elevations should be shown at the front and back of the house. In any event, care should be taken to properly locate the existing house and points of elevation taken with relation to center-line.

- b. Prepare preliminary plan and profile drawings for the mains showing the information obtained from the preliminary survey.
 - (1) Station 0+00 of the proposed main shall be equated to the interceptor main station at the point of connection.
 - (2) The plot of the main on the profile sheet shall be from left to right, beginning at 0+00 (lowest flow line elevation) progressing right in increasing stations to the highest flow line elevation.
- c. Analyze the data obtained in the foregoing steps. Determine the points where each increment of load will be added to the proposed main and prepare a tabulation showing the estimated magnitude of the population load under ultimate conditions at each of those points, showing both the incremental and cumulative load.
- d. Adjust preliminary grade on the profile, keeping mind that this grade should be sufficiently deep to accept not only the normal direct connections, but in general, the top of the proposed main should be not less than:
 - (1) Two feet below the bottom of the drainage course being paralleled;
 - (2) Far enough below the bottom of such drainage course to permit a 4" service line to pass under the drainage course with one foot of cover, approach the proposed main on at least a 1.00% grade, and match tops with the proposed main at the point of connecting; or
 - (3) Five feet below the finished grade of the street in which it is to be located; whichever condition results in the greatest depth.
- e. Determine the limiting or flatest gradient between each point of load increment.
- f. Recheck all the steps in the PRELIMINARY DESIGN PROCEDURE to be sure that the location and grade selected for the proposed main as the end result of this procedure are the best possible combinations obtainable under the governing circumstances.

DESIGN PRACTICE

1. BASIC DESIGN REQUIREMENTS

The following basic design practices are considered as standard requirements by the City of Willow Park. Under isolated conditions, warranted only by special situations, the City Engineer may recommend and/or approve variations to some of these standards.

- a. The normal location of the sewer line shall be in the south or west one-quarter of the street, as appropriate.
- b. Sewer services shall be omitted from any sanitary sewer line for lots adjacent thereto which are approved for installation in parkways or in utility easements.
- c. Sewer Services

(1) For lots with frontages of 75 feet or less:

Sanitary Sewer Services shall be located 10 feet south or west of the center of the lot frontage, as appropriate, except where the grade of the sewer serving the lot is 3.00 per cent or more. Where the sewer grade is 3.00 per cent or greater, the sanitary sewer service shall be locate 5 feet upstream from the lower lot front corner.

(2) For lots with frontages exceeding 75 feet:

Sanitary Sewer Services shall be locate 5 feet south or west of the center of the lot frontage, as appropriate, except where the grade of the sewer serving the lot Is 3.00 per cent or more. Where the sewer grade is 3.00 per cent or greater, the sanitary sewer services shall be located 5 feet upstream from the lower lot front corner.

- d. On sanitary sewer lines smaller than 24" locate manholes 300' apart. Manholes may be sapced 500' on lines 24" and larger.
- e. Provide manholes on sewer lines when horizontal angles are greater than 5°.
- f. No gravity sewer conveying raw sewage shall be less than 8 inches in diameter.
- g. Sanitary sewers 24-inch and smaller in diameter will be constructed of vitrified clay sewer pipe. (Unless otherwise specified or approved)
- h. Clean-out must be supplied at each street connection
- i. No Inverted Siphons.
- j. Where topography requires that a sanitary sewer line be installed with less than 2-½' of cover, the pipe shall either be encased in concrete or constructed of cast iron pipe through the restricted area.
- k. Auxillary power is required at sewage plant and lift stations.

1. Under the City of Willow Park Standards, sanitary sewer pipe is required to be tested by air or water to a specified condition and the pipe is required to be examined by television camera. To be able to accomplish these test phases the system shall incorporate the following features.
 - (1) Where steep grades in sanitary sewer pipe between normally spaced manholes impose excessive test pressure in the lower pipe segments and the contractor tests with water, the pipe shall incorporate tees for test purposes at appropriate intervals between the manholes. Such tees shall have the branches the same size as the run diameter; the branch shall be oriented up; the run shall be wrapped to just below the branch bell with concrete encasement; and the branch shall incorporate a plug. After test, the tees shall be plugged and then blocked with concrete.
 - (2) Project requirements shall contain provisions for the City Engineer to install television camera equipment at the end of all sanitary sewer lines. In some instances, this may require that a manhole be placed at the end of the sanitary line for that and other maintenance purposes.
- m. Water lines and sanitary sewers shall be installed no closer to each other than 9 feet. Where the 9 foot separation distance cannot be achieved, the sanitary sewer shall be constructed of cast iron, ductile iron, or PVC pipe meeting AWWA Specifications, having a minimum working pressure rating of 150 psi or greater.

2. SANITARY SEWER LATERALS

The design of sanitary sewer laterals follows the same basic design procedures as those outlined for mains and sub-mains, except of course, that the information required is reduced in complexity to conform to the reduced function of a lateral. The Preliminary Map prepared for the main may easily be utilized to show the lateral system required also.

3. FINAL DESIGN PRECEDURE

a. Sizing

- (1) Using the cumulative population load at each point of load increment, determine the load on the section below that point in GPM using:

(a) Load per person per day = 100 gal.

(b) Average load per person per day = $\frac{100}{1440}$ = 0.0694 GPM

(c) Average load for a given population
(0.0694) X (population) = GPM

(d) Ratio of design load to Avg. load is expressed by:

$$M = I + \frac{14}{4 + \sqrt{P}} \text{ (Harmon's Formula)}$$

Where: M = Ratio of design load to average load
P = Population in thousands.

(e) Design Load = M times the average load generated by the ultimate population to be served by the main being designed.

3. FINAL PLAN AND PROFILE

Prepare a final plan and profile incorporating all the information accumulated in accordance with the basic design requirements. Such final plans shall be prepared in accordance with the requirements for assembling information on plans provided under Section 1 of these Policies and Procedures. In addition, developer's engineers shall provide:

- (1) The latest development platting in the event that the platting has not been recorded.
- (2) All information needed for processing rights-of-way across private and public properties.
- (3) Test hole data
- (4) Engineer's cost estimate.

GENERAL DATA ON SEWER LOADS

<u>Approx. No. Houses Served</u>	<u>Population Served.</u>	<u>Peak Load in G.P.M.</u>	<u>Pipe Size & Gradient Required</u>	<u>Pipe Capacity on Given Grade</u>
290 or less	1000	266	811 on 0.40%	306
572	2000	504	8" on 1.00%	497
			10" on 0.30%	486
858	3000	725	10" on 0.70%	761
			12" on 0.20%	818
1144	4000	935	12" on 0.40%	952
			15" on 0.20%	1259
1430	5000	1140	12" on 0.30%	1171
			15" on 0.20%	1259

Notes

- a. Peak Loads computed using formula:

$$M + 1 + \frac{14}{4 + \sqrt{P}}$$

Where:

M - ratio of Peak Load to Avg. Load

P = Population in thousands

- b. No. Persons used per house = 3.5
- c. Load per person = 100 Gal./day
- d. Recommended Minimum Gradients

8" on 0.40%

10" on 0.29%

12" on 0.22 %

15" on 0.16%

18" on 0.12%

24" and larger 0.08%